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EXAMINER				
JACOB, MARY C				
ART UNIT		PAPER NUMBER		
2123				

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/608,756

Applicant(s)

KO ET AL.

Examiner

Mary C. Jacob

Art Unit

2123

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 June 2003.
2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
4a) Of the above claim(s) 4, 5, 9 and 17 is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-3, 6-8, 10-16, 18-22 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☒ Claim(s) 1-22 are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 27 June 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 8/28/03.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-22 have been presented for examination.
2. The Preliminary Amendment filed 6/27/03 has been considered.

Election/Restrictions

3. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-3, 6-8, 10-16, 18-22, drawn to simulating the movement of cloth using an immediate buckling model, classified in class 703, subclass 6.
 - II. Claims 4, 5, 9, 17, drawn to modeling hysteresis characteristics, classified in class 703, subclass 2.

4. The inventions are independent or distinct, each from the other because:

Inventions I and II are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different designs, modes of operation, and effects (MPEP § 802.01 and § 806.06). In the instant case, the different inventions are the method for simulating the movement of cloth and the mathematical modeling of hysteresis characteristics.

Because these inventions are independent or distinct for the reasons given above and have acquired a separate status in the art in view of their different classification, restriction for examination purposes as indicated is proper.

5. During a telephone conversation with Mr. Curt Hamre on 6/13/06, a provisional election was made without traverse to prosecute the invention of Group I, claims 1-3, 6-

8, 10-16, 18-22. Affirmation of this election must be made by applicant in replying to this Office action. Claims 4, 5, 9, 17 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Specification

6. The disclosure is objected to because of the following informalities. Appropriate correction is required.
7. Page 9, line 18 has text missing.

Claim Objections

8. Claims 1-3, 5-7, 11, 12, 14, 15, 19, 20 and 22 are objected to because of the following informalities. Appropriate correction is required.
9. As to Claim 1: line 1 recites "the movement", it would be better if written "a movement"; line 3 recites "the part", it would be better if written "a part".
10. As to Claim 2: line 7 recites "the movement", it would be better if written "a movement"; line 8 recites "the shape", it would be better if written "a shape"; line 9 recites "the distance", it would be better if written "a distance".
11. As to Claim 3: line 12 recites "the bending", it would be better if written "a bending".
12. Claim 5, line 3, has " ," at the end of the claim.
13. As to Claim 6, line 24 recites "the curvature", it would be better if written "a curvature".

14. As to Claim 7, line 2 recites "the force vector", it would be better if written "a force vector"; line 3 recites "the Jacobian", it would be better if written "a Jacobian".
15. As to Claim 11: line 15 recites "the movement", it would be better if written "a movement"; line 17 recites "the part", it would be better if written "a part".
16. Claim 11, line 2, "comprises" should read "comprising".
17. As to Claim 12: line 21 recites "the movement", it would be better if written "a movement"; line 22 recites "the shape", it would be better if written "a shape"; line 23 recites "the distance", it would be better if written "a distance".
18. As to Claim 14, line 5 recites "the curvature", it would be better if written "a curvature".
19. As to Claim 15, line 9 recites "the force vector", it would be better if written "a force vector"; line 10 recites "the Jacobian", it would be better if written "a Jacobian".
20. Claim 19, page 18, line 24 recites "the shape", it would be better if written "a shape"; page 18, line 24 recites "on deformation", it would be better if written "on a deformation"; page 18, line 25 recites "the cloth", it would be better if written "a cloth"; page 19, line 5 recites "the shape", it would be better if written, "a shape".
21. Claim 20, line 10 recites "the shape", it would be better if written "a shape"; line 10 recites "on deformation", it would be better if written "on a deformation"; line 11 recites "the cloth", it would be better if written "a cloth"; line 16 recites "the shape", it would be better if written, "a shape".
22. Claim 22 is missing a period at the end of the claim.

Claim Rejections - 35 USC § 112

23. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

24. Claims 1, 2, 6, 11-16, 19-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
25. Claims 1 and 11 recite the limitation "the deformation unit". There is insufficient antecedent basis for this limitation in the claim. It would be better if written "a deformation unit".
26. Claims 2 and 12 recite the limitation "said deformation unit". There is insufficient antecedent basis for this limitation in the claim.
27. Claims 6 and 14 recite the limitation "the bending deformation". There is insufficient antecedent basis for this limitation in the claim.
28. Claim 13 recites the limitation "the bending deformation energy". There is insufficient antecedent basis for this limitation in the claim.
29. Claim 19, page 19, line 1 recites the limitation "the deformation unit". There is insufficient antecedent basis for this limitation in the claim.
30. Claim 20, line 12 recites the limitation "the deformation unit". There is insufficient antecedent basis for this limitation in the claim.
31. Claims 11-16, 18 and 20 recite "computer-readable medium storing a program which executes a method", however, it is unclear how the "computer readable medium storing a program" can "execute" the method.

Claim Rejections - 35 USC § 101

32. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

33. Claims 1-3, 6-8, 10-16 and 18 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The claims are directed to a method of simulating, however, the claims fail to recite an actual simulating step or a step that displays or uses the result of the simulating. Therefore, the method disclosed in the claims produces no concrete, useful or tangible result.

Claim Rejections - 35 USC § 102

34. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

35. Claims 1, 10, 11, 18, 19 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Breen et al, ("Predicting the Drape of Woven Cloth Using Interacting Particles", Proceedings of the 21st Annual Conference on Computer Graphics and Interactive Techniques, Pages: 365–372, 1994).
36. As to Claims 1 and 11, Breen et al teaches: a method of simulating the movement of cloth, the method comprising a step of using an immediate buckling model, wherein the deformation unit which represents the part of the cloth of interest is

bent immediately without contraction when compressive force is applied to two extremities of said deformation unit (Figure 4a; section 4, paragraph 3).

37. As to Claims 10 and 18, Breen et al teaches: wherein the deformation unit comprises a plurality of adjacent particles when cloth is modeled as a particle model (section 3, paragraphs 2 and 3; equation 7 and description).

38. As to Claims 19 and 20, Breen et al teaches: a method of simulating the movement of cloth, the method comprising the steps of: estimating the shape of bending deformation occurring on deformation unit which represents the part of the cloth of interest by using an immediate buckling model wherein the deformation unit is bent immediately without contraction when compressive force is applied to two extremities of said deformation unit (Figure 4a; section 4, paragraph 3; section 5.2, last paragraph, equation 13); obtaining bending deformation energy accumulated on said deformation unit by estimating the shape of said deformation unit (section 5.2); and simulating the bending deformation of cloth by using the bending deformation energy (section 6, first 3 paragraphs).

39. Claims 2, 6, 12 and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by Schmidt ("An Investigation of Space Suit Mobility With Applications to EVA Operations", Ph D Thesis Summary, Massachusetts Institute of Technology, August, 2001).

40. As to Claims 2 and 12, Schmidt teaches: a method of simulating the movement of cloth, the method comprising a step of estimating the shape of said deformation unit

upon application of compressive force as a function of the distance between two extremities of said deformation unit (page 7, column 1, paragraph 1; page 7, column 2, second paragraph, "To determine..."; equation 10).

41. As to Claims 6 and 14, Schmidt teaches: wherein the estimating step further comprises the steps of: estimating the curvature of said deformation unit as a function of distance between two extremities of said deformation unit, and estimating the shape of the bending deformation from the estimated curvature (page 7, column 1, paragraph 1; page 7, column 2, second paragraph, "To determine..."; equation 10).

Claim Rejections - 35 USC § 103

42. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

43. Claims 3, 13, 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schmidt as applied to claims 2 and 12 above, in view of Breen et al.
44. As to Claims 3, 13, 21 and 22, Schmidt teaches a method of simulating the movement of cloth, the method comprising a step of estimating the shape of said deformation unit upon application of compressive force as a function of the distance between two extremities of said deformation unit, estimating the curvature of said deformation unit as a function of distance between two extremities of said deformation unit, and estimating the shape of the bending deformation from the estimated curvature (page 7, column 1, paragraph 1; page 7, column 2, second paragraph, "To determine..."; equation 10).
45. Schmidt does not expressly teach: a step of calculating the bending deformation energy stored in said deformation unit by estimating the shape of the deformation unit; wherein the deformation unit comprises a plurality of adjacent particles when cloth is modeled as a particle model.
46. Breen et al teaches a new technique for reliably reproducing the characteristic drape of particular fabrics (Introduction, paragraph 2, sentence 1) that includes a step of calculating the bending deformation energy stored in said deformation unit by estimating the shape of the deformation unit (section 5.2); wherein the deformation unit comprises a plurality of adjacent particles when cloth is modeled as a particle model (section 3, paragraphs 2 and 3; equation 7 and description).
47. Schmidt and Breen et al are analogous art since they are both directed to the modeling of fabrics.

48. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of simulating the movement of cloth as taught in Smith to include a step of calculating the bending deformation energy stored in said deformation unit by estimating the shape of the deformation unit; wherein the deformation unit comprises a plurality of adjacent particles when cloth is modeled as a particle model as taught in Breen et al since Breen et al teaches a new technique for reliably reproducing the characteristic drape of particular fabrics (Introduction, paragraph 2, sentence 1).

49. Claims 7, 8, 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schmidt and Breen et al as applied to claims 3 and 13 above, and further in view of Kang et al ("Complex Deformable Objects in Virtual Reality", VRST '02, Hong Kong, November 11-13, 2002).

50. As to Claims 7, 8, 15 and 16, Schmidt and Breen et al teach a method of simulating the movement of cloth comprising a step of calculating the bending deformation energy stored in said deformation unit by estimating the shape of the deformation unit (Breen et al, section 5.2) and teach differentiating the bending deformation energy (Breen et al, equation 9).

51. Schmidt and Breen et al do not expressly teach differentiating the bending deformation energy to obtain the force vector at the two extremities of the deformation unit; and obtaining the Jacobian matrix of the force vector, wherein the Jacobian matrix

is an element for simulating the bending deformation of cloth, wherein terms having negative eigenvalues are dropped from the Jacobian matrix.

52. Kang et al teaches an efficient technique that can generate realistic animation of complex cloth objects, the technique of which makes it possible to integrate realistic deformable objects into virtual reality systems without violating the interactivity of the system (Abstract, second to last sentence). Kang et al teaches obtaining the force vector at the two extremities of the deformation unit (equation 4; section 3.1, paragraph 1, equations 9 and 10); obtaining the Jacobian matrix of the force vector (equation 4, equation 11 and description), wherein the Jacobian matrix is an element for simulating the bending deformation of cloth (section 6, paragraph 1), wherein terms having negative eigenvalues are dropped from the Jacobian matrix (page 51, column 2, paragraphs 3-4).

53. Schmidt and Breen et al and Kang et al are analogous art since they are both directed to the simulation of movement of cloth.

54. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of simulating the movement of cloth comprising a step of calculating the bending deformation energy stored in said deformation unit by estimating the shape of the deformation unit and differentiating the bending deformation energy as taught in Schmidt and Breen et al to include differentiating the bending deformation energy to obtain the force vector at the two extremities of the deformation unit; and obtaining the Jacobian matrix of the force vector, wherein the Jacobian matrix is an element for simulating the bending

deformation of cloth, wherein terms having negative eigenvalues are dropped from the Jacobian matrix as taught by Kang et al since Kang et al teaches an efficient technique that can generate realistic animation of complex cloth objects, the technique of which makes it possible to integrate realistic deformable objects into virtual reality systems without violating the interactivity of the system (Abstract, second to last sentence).

Conclusion

55. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.
56. Cabal et al (US Patent 6,869,169) teaches a deformable element formed to have a residual shape bowing outward from the central plane in a first direction away from the second layer wherein a beam is hinged at either end and the beam is subjected to compressive forces.
57. Ng et al ("Computer Graphics Techniques for Modeling Cloth", Computer Graphics in Textiles and Apparel, September, 1996) summarizes 19 cloth modeling techniques.
58. Hadap et al ("Animating Wrinkles on Clothes", Proceedings, Visualization '99 24-29 Oct. 1999) teaches a method to simulate realistic wrinkles on clothes without fine mesh and large computational overheads.
59. Comer et al ("Deflections of an Inflated Circular-Cylindrical Cantilever Beam", AIAA Journal, Volume 1, No. 7, pages 1652-1655, July 1963) teaches the consideration

of beam deflections and stresses for loads between incipient buckling and final collapse in inflatable structures for applications in space.

60. Main et al ("Beam-Type Bending of Space-Based Inflated Membrane Structures", Journal of Aerospace Engineering, Volume 8, No. 2, pages 120-125, April 1995) teaches an improved model for the bending behavior of space-based inflated cylindrical shells used as load-bearing beams.


61. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mary C. Jacob whose telephone number is 571-272-6249. The examiner can normally be reached on M-F 7AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez can be reached on 571-272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mary C. Jacob
Examiner
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MCJ
6/19/06


Paul D. Rodriguez 6/23/06
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Art Unit 24252123